CLAIMS

SUBA1) 1. A data processor for processing a block formed by two-dimensional data in a plurality of rows and a plurality of columns, characterized in that it comprises:

storage means for storing the data of the block;

write means for writing the data of the block in said storage means in a first order of scan; and

read means for reading the data of the block stored in said storage means in a second order of scan and in that:

said storage means includes n memories where n is an integer equal to or greater than 2, and the data of the block are distributed to said n memories such that n items of data consecutive in the first order of scan are stored in n different memories and n items of data consecutive in the second order of scan are stored in the different n memories;

said write means simultaneously writes data in the different memories in the first order of scan; and

said read means simultaneously reads the data from the different memories in the second order of scan.

2. A data processor for processing a block formed by two-dimensional data in m rows and m columns, characterized in that it comprises:

storage means for storing the data of the block;

write means for writing the data of the block in said

storage means in a first order of scan; and

read means for reading the data of the block stored in said storage means in a second order of scan and in that:

said storage means includes n memories where said n is a divisor of m which is equal to or greater than 2, and the data of the block are distributed to said n memories such that n items of data consecutive in the first order of scan are stored in n different memories and n items of data consecutive in the second order of scan are stored in the different n memories;

said write means simultaneously writes data in different n memories in the first order of scan; and

said read means simultaneously reads the data from the n different memories in the second order of scan.

3. A data processor according to Claim 1 or 2, characterized in that said first order of scan is the order of raster scan in either of a column direction and a row direction and in that said second order of scan is the order of raster scan in the other of the column direction and the row direction.

4. A data processor according to Claim 1 or 2, characterized in that said first order of scan is either of the order of raster scan and the order of zigzag scan and in that said second order of scan is the other of the order of raster scan and the order of zigzag scan.

SUB A2 5. A method for processing data for processing a block

formed by two-dimensional data in a plurality of rows and a plurality of columns, characterized in that it comprises the steps of:

distributing the data of the block to n memories and storing them in the different memories by simultaneously writing the same in a first order of scan such that n items of data (n is an integer equal to or greater than 2) consecutive in the first order of scan are stored in the n different memories and such that n items of data consecutive in a second order of scan are stored in the n different memories; and

reading the stored data of a block from the different memories in the second order of scan by.

6. A method for processing data for processing a block formed by two-dimensional data in m rows and m columns, characterized in that it comprises the steps of:

distributing the data of the block to n memories and storing them in the different memories by simultaneously writing the same in a first order of scan such that n items of data (n is an integer equal to or greater than 2, and n is a divisor of m which is equal to or greater than 2) consecutive in the first order of scan are stored in the n different memories and such that n items of data consecutive in a second order of scan are stored in the n different memories; and

reading the stored data of a block from the different memories in the second order of scan by simulataneously.

7. A method for processing data according to Claim 5 or 6, characterized in that said first order of scan is the order of raster scan in either of the column direction and the row direction and in that said second order of scan is the order of raster scan in the other of the column direction and the row direction.

8. A method for processing data according to Claim 5 or 6, characterized in that said first order of scan is either of the order of raster scan and the order of zigzag scan and in that said second order of scan is the other of the order of raster scan and the order of zigzag scan.

~~9. A Huffman encoder for encoding DCT coefficients into~~ Huffman codes, characterized in that it comprises:

storage means for storing a plurality of DCT coefficients;

read means for reading a plurality of the DCT coefficients stored in said storage means at a time;

counting means for counting the number of consecutive invalid coefficients until a valid coefficient is encountered in the DCT coefficients read by said read means from said storage means and for sequentially outputting data constituted by combinations of the number of consecutive invalid coefficients and a valid coefficient; and

encoding means for performing a Huffman encoding process based on the data sequentially output by said counting means

to generate Huffman codes.

10. A Huffman encoder for encoding DCT coefficients into Huffman codes, characterized in that it comprises:

storage means for storing a plurality of DCT coefficients;

read means for reading a plurality of the DCT coefficients stored in said storage means at a time;

a plurality of data buses for respectively transferring a plurality of the DCT coefficients read by said read means from said storage means at a time;

a plurality of data storage means for storing input data and outputting the same in the order of input;

counting means for counting the number of consecutive invalid coefficients until a valid coefficient is encountered in the DCT coefficients transferred by said plurality of data buses and for sequentially inputting data constituted by combinations of the number of consecutive invalid coefficients and a valid coefficient to said plurality of data storage means;

selection means for sequentially selecting and outputting data respectively output by said plurality of data storage means; and

encoding means for performing a Huffman encoding process based on the data output by said selection means to generate Huffman codes.

11. A Huffman decoder for decoding Huffman codes into

DCT coefficients, characterized in that it comprises:

decoding means for performing a Huffman decoding process on Huffman codes input thereto to sequentially output data constituted by combinations of the number of consecutive invalid coefficients and a valid coefficient;

generation means for generating DCT coefficients based on the data output by said decoding means and for outputting a plurality of the generated DCT coefficients at a time;

storage means for storing a plurality of DCT coefficients; and

write means for writing a plurality of the DCT coefficients output by said generation means in said storage means at a time.

12. A Huffman decoder for decoding Huffman codes into DCT coefficients, characterized in that it comprises:

decoding means for performing a Huffman decoding process on Huffman codes input thereto to sequentially output data constituted by combinations of the number of consecutive invalid coefficients and a valid coefficient;

a plurality of data storage means for storing data input thereto and for outputting the same in the order of input;

selection means for selecting the data output by said decoding means and sequentially inputting the same to in order of said plurality of data storage means;

generation means for generating DCT coefficients based

~~on the~~ data output by said plurality of data storage means and for outputting a plurality of the generated DCT coefficients at a time;

a plurality of data buses for respectively transferring a plurality of the DCT coefficients output by said generation means at a time;

storage means for storing a plurality of DCT coefficients; and

write means for writing a plurality of the DCT coefficients transferred by said plurality of data buses in said storage means at a time.

13. A method for Huffman encoding for encoding DCT coefficients into Huffman codes, characterized in that it comprises the steps of:

reading a plurality of DCT coefficients at a time;

counting the number of consecutive invalid coefficients until a valid coefficient is encountered among the transferred DCT coefficients and sequentially calculating data constituted by combinations of the number of consecutive invalid coefficients and a valid coefficient; and

performing a Huffman encoding process based on the sequentially calculated data to generate Huffman codes.

14. A method for Huffman encoding for encoding DCT coefficients into Huffman codes, characterized in that it comprises the steps of:

reading a plurality of DCT coefficients at a time;

transferring the plurality of read DCT coefficients using a plurality of data buses respectively;

storing the transferred data respectively;

counting the number of consecutive invalid coefficients until a valid coefficient is encountered among the read DCT coefficients and sequentially calculating data constituted by combinations of the number of consecutive invalid coefficients and a valid coefficient; and

performing a Huffman encoding process based on the calculated data to generate Huffman codes.

15. A method for Huffman decoding for decoding Huffman codes into DCT coefficients, characterized in that it comprises the steps of:

performing a Huffman decoding process on Huffman codes input thereto;

sequentially outputting data constituted by combinations of the number of consecutive invalid coefficients and a valid coefficient;

generating DCT coefficients based on the output data;

outputting a plurality of the generated DCT coefficients at a time; and

writing a plurality of the output DCT coefficients at a time.

16. A method for Huffman decoding for ~~decoding Huffman~~

codes into DCT coefficients, characterized in that it comprises the steps of:

performing a Huffman decoding process on Huffman codes input thereto;

sequentially calculating data constituted by combinations of the number of consecutive invalid coefficients and a valid coefficient;

selectively storing the calculated data;

generating DCT coefficients based on the stored data;

outputting a plurality of the generated DCT coefficients at a time;

transferring the plurality of output DCT coefficients using a plurality of data buses respectively; and

writing a plurality of the transferred DCT coefficients at a time.

17. A Huffman decoder for decoding Huffman codes input thereto to output decoded data, characterized in that it comprises:

a plurality of first storage means for respectively storing a predetermined number of Huffman codes among a plurality of Huffman codes;

a plurality of match detection means provided in association with said plurality of first storage means for detecting match between an input Huffman code and the Huffman codes stored in the first storage means associated therewith;

second storage means for storing a predetermined number of decoded data associated with said predetermined number of Huffman codes respectively and for outputting any of said predetermined number of decoded data in response to a signal output by said plurality of match detection means;

frequency-of-occurrence generating means for generating a frequency of occurrence based on a Huffman code input thereto; and

third storage means for storing decoded data in an address indicated by the frequency of occurrence of at least the plurality of remaining Huffman codes among said plurality of Huffman codes, receiving the frequency of occurrence generated by said frequency-of-occurrence generating means as an address signal and outputting decoded data from an address specified by the address signal.

18. The Huffman decoder according to Claim 17, characterized in that said predetermined number of Huffman codes have frequencies of occurrence higher than those of the remaining Huffman codes.

19. The Huffman decoder according to Claim 17, characterized in that said frequency-of-occurrence generating means includes:

constant storing means for storing a constant set for each code length of Huffman codes;

minimum code storing means for storing a minimum code

for each code length of the Huffman codes;

code length detection means for detecting the code length of a Huffman code input thereto based on the minimum code for each code length stored in said minimum code storing means;

constant selection means for selecting any of the constants stored in said constant storing means based on the code length detected by said code length detection means; and

calculation means for calculating a frequency of occurrence based on the constant selected by said constant selection means and the input Huffman code.

20. A Huffman decoder according to Claim 17, characterized in that it further comprises decoded data selecting means for selectively outputting decoded data output by said second and third storage means.

21. A method for Huffman decoding for decoding Huffman codes to output decoded data, characterized in that it comprises the steps of:

storing a predetermined umber of Huffman codes among a plurality of Huffman codes respectively;

storing a predetermined number of decoded data associated with said predetermined number of Huffman codes respectively;

detecting match between an input Huffman code and said stored Huffman codes associated therewith;

outputting any of said predetermined number of decoded data in response to said match detection signal;

storing decoded data in an address indicated by the frequency of occurrence of at least the plurality of remaining Huffman codes among said plurality of Huffman codes;

generating a frequency of occurrence based on the input Huffman code;

receiving said frequency of occurrence as an address signal; and

outputting decoded data from an address specified by said address signal.

22. A method for Huffman decoding according to Claim 21, characterized in that said predetermined number of Huffman codes have frequencies of occurrence higher than those of the remaining Huffman codes.

23. A method for Huffman decoding according to Claim 21, characterized in that said step of generating a frequency of occurrence includes the steps of:

storing a constant set for each code length of Huffman codes;

storing a minimum code for each code length of the Huffman codes;

detecting the code length of an input Huffman code based on said stored minimum code for each code length;

selecting any of the stored constants based on said

detected code length; and

generating a frequency of occurrence based on the selected constant and the input Huffman code.

24. A method for Huffman decoding according to Claim 21, characterized in that the output decoded data are selectively output.